

Application for Federal Assistance SF-424

Version 02

* 1. Type of Submission:

- ☐ Preapplication
☒ Application
☐ Changed/Corrected Application

* 2. Type of Application:

- ☒ New
☐ Continuation
☐ Revision

* If Revision, select appropriate letter(s):

* Other (Specify)

* 3. Date Received:

12/14/2009

4. Applicant Identifier:

5a. Federal Entity Identifier:

* 5b. Federal Award Identifier:

State Use Only:

6. Date Received by State:

7. State Application Identifier:

8. APPLICANT INFORMATION:

* a. Legal Name: Missouri Department of Agriculture

* b. Employer/Taxpayer Identification Number (EIN/TIN):

43-1629794

* c. Organizational DUNS:

878192673

d. Address:

* Street1:

1616 Missouri Blvd.

Street2:

P.O. Box 630

* City:

Jefferson City

County:

Cole

* State:

MO: Missouri

Province:

* Country:

USA: UNITED STATES

* Zip / Postal Code:

65102-0630

e. Organizational Unit:

Department Name:

Missouri Department of Agricul

Division Name:

Office of Director

f. Name and contact information of person to be contacted on matters involving this application:

Prefix:

Ms.

* First Name:

Jane

Middle Name:

* Last Name:

McIntosh

Suffix:

Title: Grant Manager

Organizational Affiliation:

Missouri Department of Agriculture

* Telephone Number:

573-522-1955

Fax Number:

573-751-5002

* Email:

Jane.McIntosh@mda.mo.gov

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9. Type of Applicant 1: Select Applicant Type:

A: State Government

Type of Applicant 2: Select Applicant Type:

Type of Applicant 3: Select Applicant Type:

* Other (specify):

* 10. Name of Federal Agency:

Environmental Management Consolidated Business Cen

11. Catalog of Federal Domestic Assistance Number:

81.128

CFDA Title:

Energy Efficiency & Conservation Block Grant Program

* 12. Funding Opportunity Number:

DE-FOA-0000148

* Title:

Recovery Act: Energy Efficiency and Conservation Block Grants: Competitive Solicitation: Retrofit Ramp-up and General Innovation Fund Programs

13. Competition Identification Number:

Title:

14. Areas Affected by Project (Cities, Counties, States, etc.):

Statewide

* 15. Descriptive Title of Applicant's Project:

Missouri Agricultural Energy Saving Team-A Revolutionary Opportunity (MAESTRO)
Strengthening the financial viability and environmental soundness of Missouri's small animal farms.

Attach supporting documents as specified in agency instructions.

Add Attachments

Delete Attachments

View Attachments

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16. Congressional Districts Of:

* a. Applicant

4

* b. Program/Project

MO-all

Attach an additional list of Program/Project Congressional Districts if needed.

Add Attachment

Delete Attachment

View Attachment

17. Proposed Project:

* a. Start Date:

05/01/2010

* b. End Date:

04/30/2013

18. Estimated Funding (\$):

* a. Federal	9,766,698.00
* b. Applicant	0.00
* c. State	0.00
* d. Local	0.00
* e. Other	0.00
* f. Program Income	0.00
* g. TOTAL	9,766,698.00

* 19. Is Application Subject to Review By State Under Executive Order 12372 Process?

☒ a. This application was made available to the State under the Executive Order 12372 Process for review on

12/16/2009

☐ b. Program is subject to E.O. 12372 but has not been selected by the State for review.☐ c. Program is not covered by E.O. 12372.

* 20. Is the Applicant Delinquent On Any Federal Debt? (If "Yes", provide explanation.)

☐ Yes☒ No

Explanation

21. *By signing this application, I certify (1) to the statements contained in the list of certifications** and (2) that the statements herein are true, complete and accurate to the best of my knowledge. I also provide the required assurances** and agree to comply with any resulting terms if I accept an award. I am aware that any false, fictitious, or fraudulent statements or claims may subject me to criminal, civil, or administrative penalties. (U.S. Code, Title 218, Section 1001)

☒ ** I AGREE

** The list of certifications and assurances, or an internet site where you may obtain this list, is contained in the announcement or agency specific instructions.

Authorized Representative:

Prefix:

Dr.

* First Name:

Jon

Middle Name:

* Last Name:

Hagler

Suffix:

* Title:

Director

* Telephone Number:

573-751-5617

Fax Number:

573-751-1784

* Email:

mdadirector@mda.mo.gov

* Signature of Authorized Representative:

Jane McIntosh

* Date Signed:

12/14/2009

Authorized for Local Reproduction

Standard Form 424 (Revised 10/2005)
Prescribed by OMB Circular A-102

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*** Applicant Federal Debt Delinquency Explanation**

The following field should contain an explanation if the Applicant organization is delinquent on any Federal Debt. Maximum number of characters that can be entered is 4,000. Try and avoid extra spaces and carriage returns to maximize the availability of space.

Project/Performance Site Location(s)

Project/Performance Site Primary Location ☐ I am submitting an application as an individual, and not on behalf of a company, state, local or tribal government, academia, or other type of organization.

Organization Name: Missouri Department of Agriculture
DUNS Number: 8781926730000
* Street1: 1616 Missouri Blvd.
Street2: P.O. Box 630
* City: Jefferson City County: Cole
* State: MO: Missouri
Province:
* Country: USA: UNITED STATES
* ZIP / Postal Code: 65102-0630 * Project/ Performance Site Congressional District: MO-004

Project/Performance Site Location 1 ☐ I am submitting an application as an individual, and not on behalf of a company, state, local or tribal government, academia, or other type of organization.

Organization Name: Curators of the University of Missouri
DUNS Number: 1538902720000
* Street1: Office of Sponsored Programs Administration
Street2: University of Missouri
* City: 310 Jesse Hall County: Boone
* State: MO: Missouri
Province:
* Country: USA: UNITED STATES
* ZIP / Postal Code: 65211-1230 * Project/ Performance Site Congressional District: MO-009

DISCLOSURE OF LOBBYING ACTIVITIES

Complete this form to disclose lobbying activities pursuant to 31 U.S.C.1352

Approved by OMB

0348-0046

1. * Type of Federal Action: <input type="checkbox"/> a. contract <input checked="" type="checkbox"/> b. grant <input type="checkbox"/> c. cooperative agreement <input type="checkbox"/> d. loan <input type="checkbox"/> e. loan guarantee <input type="checkbox"/> f. loan insurance	2. * Status of Federal Action: <input type="checkbox"/> a. bid/offer/application <input checked="" type="checkbox"/> b. initial award <input type="checkbox"/> c. post-award	3. * Report Type: <input checked="" type="checkbox"/> a. initial filing <input type="checkbox"/> b. material change
4. Name and Address of Reporting Entity: <input checked="" type="checkbox"/> Prime <input type="checkbox"/> SubAwardee * Name: Missouri Department of Agriculture * Street 1: 1616 Missouri Blvd. Street 2: P.O. Box 630 * City: Jefferson City State: MO: Missouri Zip: 65102-0630 Congressional District, if known: 4		
5. If Reporting Entity in No.4 is Subawardee, Enter Name and Address of Prime:		
6. * Federal Department/Agency: DE-FOA-0000148	7. * Federal Program Name/Description: Energy Efficiency & Conservation Block Grant Program CFDA Number, if applicable: 81.128	
8. Federal Action Number, if known:	9. Award Amount, if known: \$	
10. a. Name and Address of Lobbying Registrant: Prefix: Ms. * First Name: Rachael Middle Name: * Last Name: Mobley Suffix: * Street 1: 1616 Missouri Blvd. Street 2: * City: Jefferson City State: MO: Missouri Zip: 65109		
b. Individual Performing Services (including address if different from No. 10a) Prefix: Ms. * First Name: Rachael Middle Name: * Last Name: Mobley Suffix: * Street 1: Street 2: * City: State: Zip:		
11. Information requested through this form is authorized by title 31 U.S.C. section 1352. This disclosure of lobbying activities is a material representation of fact upon which reliance was placed by the tier above when the transaction was made or entered into. This disclosure is required pursuant to 31 U.S.C. 1352. This information will be reported to the Congress semi-annually and will be available for public inspection. Any person who fails to file the required disclosure shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure. * Signature: Jane McIntosh * Name: Prefix: Dr. * First Name: Jon Middle Name: * Last Name: Hagler Suffix: Title: Director Telephone No.: 573-751-5617 Date: 12/14/2009		
Federal Use Only:		Authorized for Local Reproduction Standard Form - LLL (Rev. 7-97)

Missouri Agricultural Energy Saving Team – A Revolutionary Opportunity (MAESTRO)

Project Objectives

Statement of goals and objectives

The goal of this project, entitled the *Missouri Agricultural Energy Saving Team – A Revolutionary Opportunity (MAESTRO)* is to strengthen the financial viability and environmental soundness of Missouri's small animal farms by helping them implement energy efficient technologies. To do this, a collaborative project team led by the Missouri Department of Agriculture (MDA) in collaboration with the Missouri Department of Natural Resources (MDNR), the University of Missouri (MU), and EnSave, Inc. propose to saturate the small animal farm sector in Missouri with energy efficiency education and retrofits.

The target population is approximately 2,365 small animal farm operations in Missouri. These farm operations are an identifiable community of farms—that are struggling to survive financially and currently using some of the least energy efficient technologies. As such, this target population has great potential for impact and can serve as a national model for an energy conservation approach that yields high results—making significant reductions in state energy usage and improving the finances of small farms to keep small animal farmers in their homes and on the job.

Specifically, the project will implement a plan of energy efficiency education, audits, loans and retrofitting activities to achieve the following objectives in Missouri within three years.

Objective 1. Improve the environment by:

- a) reducing annual fossil fuel emissions by 17.4 metric tons of carbon dioxide equivalent; and
- b) reducing the total energy use on at least 290 small animal farms by at least 8,000 kWh and 2,343 therms per farm.

Objective 2. Maximize benefits for local and regional communities by:

- a) stimulating the economy by creating or retaining at least 222 jobs, and
- b) saving small animal farmers an average of \$2,071 per farm in annual energy expenditures.

Plan to successfully meet goals and objectives

Target population

The plan to meet the project objectives focuses on the population of small animal farms in Missouri, specifically those farms in the swine, poultry and dairy industries that are not permitted as a confined feeding operation (CAFO). Energy retrofits are planned for both the production facility and the homes on these farms. The MU Extension field specialists have agricultural field faculty and housing specialists already in place in every county of Missouri. MU Extension will thus leverage its existing contact with Missouri animal farmers and knowledge of rural communities to contact and recruit potential participants.

Similarly, each county has a Soil and Water Conservation District that supplies technical and financial support—Missouri's small animal farmers have continually increasing input costs in a declining economy, and as a result most are financially struggling. Last year Missouri lost approximately 25% of its small dairy farmers and similar numbers of swine and poultry farms—and the coming years will likely be equally as difficult.

Missouri Agricultural Energy Saving Team – A Revolutionary Opportunity (MAESTRO)

These data point to the difficulty of recruiting farmers to participate, but also the grave need for projects that can reduce their input costs. As such, this project represents the potential for a significant impact on Missouri's economy. The project will focus its efforts on animal operations with more than \$50,000 in farm revenues per year; these are the farmers with the greatest capacity to assume the financial burden of a retrofitting project. Assuming a 12% participation rate over the first three years, this means the project expects to make loans and coordinate retrofits on approximately 290 farms and residences.

Marketing & awareness

The partners will develop a marketing plan and related publications to promote the MAESTRO initiative. Through its ongoing work developing non-formal educational resources for the Missouri agricultural community, MU Extension already develops hundreds of educational and outreach publications per year and maintains websites generating approximately tens of thousands of hits per year. EnSave has developed similar publications for their clients since their inception in the early 1990's.

The Missouri Rural Electric Cooperatives will be a valuable partner in the marketing and outreach efforts to recruit participants—each of the 47 electric co-ops in Missouri is an important community organization for small animal farmers and has the best local knowledge of farmers' energy needs. The Missouri Rural Electric Cooperatives will support the project by promoting the project in the energy bills it distributes and by building awareness through information published in its award-winning statewide publication, *Rural Missouri*.

Education, assessment & audits

The MAESTRO project rests on the assumption that sustainable change in agricultural practices—can only occur when agricultural energy audits and retrofitting activities are paired with energy efficiency education. Only when farmers understand the potential impact of the retrofits (to motivate adoption) and integrate that energy efficiency mindset into all of their farm practices (to motivate a permanent shift in this sector's energy usage) will significant and sustainable change occur. The project plan is a two-tiered approach, beginning with educational resources and an opportunity for initial assessment, followed by additional contact to determine if a full energy audit is of interest. Personal contacts as well as an on-line resource center will provide farmers a preliminary sense of the potential cost and energy savings various retrofitting options would offer. The farmer could enter information about their home and/or equipment they currently use into a computer terminal via a webpage specifically designed for the project. This webpage would contain information associated with equipment that consumes energy so that the early data entry could be completed to allow: 1) the end user to make an informed decision as to if they could benefit from an energy audit and 2) the information logged to be made available for EnSave and the extension associates as they contact, plan and conduct an audit for the farmer.

This online resource center would provide basic information on the full audit, loan and retrofit tier of the project, as well. University Extension field specialists or EnSave's program representatives would follow-up with individual farmers who complete self-assessments to see if they are interested in pursuing a full audit and to schedule the audit. At this time, the MDA and MDNR would also be available to counsel farmers on the various agricultural loan, rebate and assistance programs available in Missouri.

EnSave, a national leader in agricultural energy efficiency and resource conservation, will train University Extension field specialists to perform the full agricultural energy audits, using its Farm Energy Audit Tool (FEAT). Since 1991, EnSave has performed farm energy audits for over 2,000 agricultural producers and has used that experience to develop internet-based software that can manage audits in the dairy, poultry, swine and grain drying industries. The FEAT audit tool allows for data collection and entry, including pictures and customizable audits.

Missouri Agricultural Energy Saving Team – A Revolutionary Opportunity (MAESTRO)

EnSave's FEAT farm energy audits begin with a producer interview. We then collect and analyze energy usage data using our FEAT software and compile the information into a narrative audit report for the producer. This basic energy audit meets the criteria outlined in the Natural Resource Conservation Service (NCRS) guidance for audits funded through NCRS.

Funding structure

The MDA will manage a revolving loan and rebate program. Approximately \$1,075,000 of the grant funds will be rebated to farmers who implement the recommendations in their audit. The balance of the funds available (\$4,300,000) will establish as a revolving loan fund for the farmers who retrofit with energy saving equipment and/or materials.

The loan payback period will be structured to match the likely payback length of the retrofitting activities. MAESTRO recognizes the ability of farmers to pay back their loans is dependent on the energy savings—most small animal farmers at present cannot afford additional loan payments. A payback period of 2 ½ years per loan is ideal—but adjustments will be made based on the retrofitting activities.

Verification

EnSave will set the process for verifying energy savings from installed equipment, by requiring proof of installation from the farmer (equipment invoice and form stating equipment has been installed). EnSave will use its extensive experience to create an Evaluation Measurement and Verification (EM&V) protocol and quality control plan that will be used to evaluate and verify energy savings within the program. The MU Pollution Prevention Program, which has experience collecting and reporting energy savings data to federal agencies, will be responsible for implementing the EM&V protocol and quality control plan.

The Pollution Prevention team will be responsible for training a dedicated EM&V intern to carry out the bulk of the EM&V activities. In the past several years the Pollution Prevention control team has used Environmental Protection agency funding to finalize a successful intern model for use in EM&V activities. Once the plan is underway, EnSave will ensure the plan is working according to its intended design.

Merit Review Criteria

Criterion 1: Leveraging and Sustainability weight:

This project will leverage funds at the ratio of 5:1, using a combination of funds from the MDNR' Missouri Energy Center and its Soil and Water Conservation Program; from the state's LINK deposits and MDA's agricultural loan guarantee programs, and through the in-kind contribution of faculty and staff time to the project from these agencies and MU.

The Energy Center will support this effort through its outreach efforts for the State Energy Program. In addition, we have calculated expected expenditures from those two programs for those eligible under this proposal. Similarly, the Soil and Water Conservation Program will work with the Soil and Water Districts in each county to advertize MAESTRO to farmers.

State Energy Program

The MDNR' Energy Center administers State Energy Program funding. With the expansion of this funding under ARRA, the Center is directing a portion of this funding to the agricultural sector of the economy. We have pro-rated this funding total using the farm population eligible to be served by this

Missouri Agricultural Energy Saving Team – A Revolutionary Opportunity (MAESTRO)

effort to determine that \$400,000 of those funds are appropriate for leveraging of this effort. Because future funding levels are unknown, we do not leverage any future income to this program beyond those funds already received.

Soil and Water Conservation Program

The MDNR's Soil and Water Conservation Program is responsible for helping farmers implement practices and technologies for sound environmental stewardship. Many of these practices and technologies also provide an additional benefit of energy savings for the farmer. The cost share funding level the last three years averaged \$26 million. Many very small farms do not use this fund nor are the largest farms eligible, so the population targeted in this effort matches very well with the farm sizes enrolled in that program. To determine the leveraging available for this effort, this amount was pro-rated by the number of farms eligible and practices used. This provides a total of \$7.5 million per year for leveraging for a total of \$22.5 million over three years.

Missouri Department of Agriculture

The MDA has determined that this effort will leverage \$ 17,000,000 funds that are expended through the following programs: 1) Animal Waste Treatment System Program, 2) Single-Purpose Animal Facilities Loan Guarantee Program, 3) Value-Added Loan Guarantee Program, 3) New Generation Cooperative Incentive Tax Credits, and 5) the Alternative Loan Program.

University of Missouri

MU will contribute a total of \$ 1,433,515 in leveraged funds over the course of the three year project. MU's leveraged funds will come from the contribution of faculty and staff time to the project.

Sustainable market transformation

The new investment by the Department of Energy alongside these extensive leveraged funds will make it possible for the MAESTRO team to create meaningful and sustainable market transformation in the small animal agricultural community. Given the number of small animal farmers in Missouri, the project team has determined the amount is sufficient to saturate this niche community. After the first three years of grant funds are expended—the team anticipates continued interest because the program impact will be visible and significant. A revolving loan fund structure has been put in place as part of the project plan and will be managed by the MDA to sustain participation.

Criterion 2: Project Impact weight:
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In this proposal the State of Missouri and MU will help the federal Department of Energy meet its long term goal of energy independence and leadership on climate change by providing intensive assistance to small animal farms in Missouri. Although they are not geographically concentrated, small animal farms in Missouri represent an identifiable community that can be meaningfully saturated with retrofitting and energy assistance.

This project team will demonstrate the powerful combination of economic assistance to the nation's struggling small farmers and significant reductions in energy consumption that can come from improving farm energy practices. As shown below, small farms in Missouri are an identifiable population that is economically struggling and at the same time, a big contributor to unnecessarily high energy use in the state.

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The technology and expertise certainly exists to provide small animal farmers with high quality retrofits that will net significant energy and cost savings quickly (within months not years); however, to date no funds have been available to specifically target and saturate this market community with energy efficiency retrofits.

Size of target audience

The target audience is animal feeding operations and their associated residences in Missouri that would benefit from improved energy efficiency. According to 2007 Census of Agriculture data, there are a total of 2,365 individual farms meeting our criteria of animal farm operations in Missouri. These are farms that are not permitted CAFO operations. This eliminates the largest commercial operations in Missouri and allows us to focus on smaller, often family owned farms. These farms are commonly organized as family or privately held corporations. The estimates of farms and animals in our target audience by animal are provided below (2007 Census of Agriculture).

Dairy. In 2007, Missouri had 1,230 dairy farms with a total inventory between 20 and 999 dairy cows. The target dairies have a total inventory of 91,071 cows, an average of about 74 cows per farm. These dairies tend to be clustered in southwest Missouri. In the map below, 1 dot equals 2000 milk cows.

Poultry. Poultry consists of both broilers and turkeys. In 2007, Missouri had 126 broiler farms with an average of 340,000 birds per farm; 323 turkey farms with an average of 48,500 birds per farm. Poultry producers tend to be clustered in southwest and central Missouri. In the maps below, 1 dot equals 1 million broilers or 100,000 turkeys.

Swine. In 2007, Missouri had 686 hog farms with total inventory between 200 and 4999 pigs – an average of 1300 pigs per farm. Hog farms tend to be clustered in western, central and northern Missouri. In the

Missouri Agricultural Energy Saving Team – A Revolutionary Opportunity (MAESTRO)

map below, 1 dot equals 20,000 hogs and pigs.

Figure 1. Number and location of Dairy Farms in Missouri with <1,000 cows

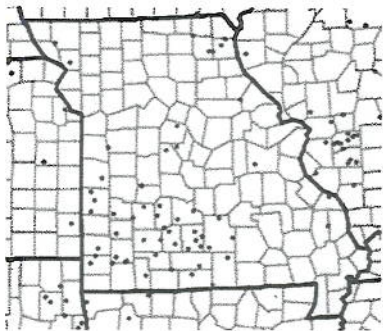


Figure 1. Number and location of swine farms in Missouri with 200 to 4999 pigs

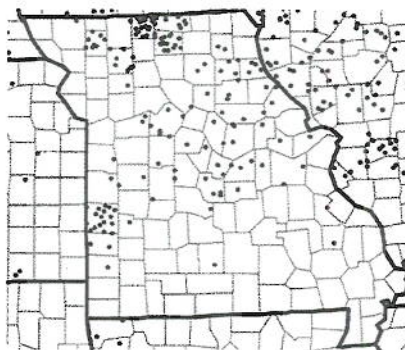
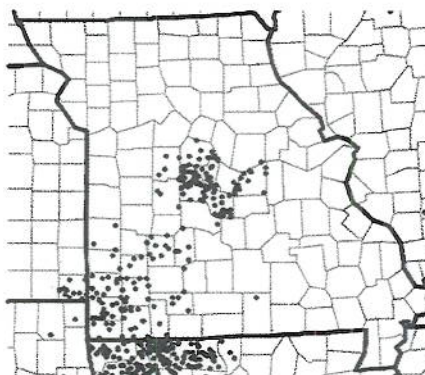
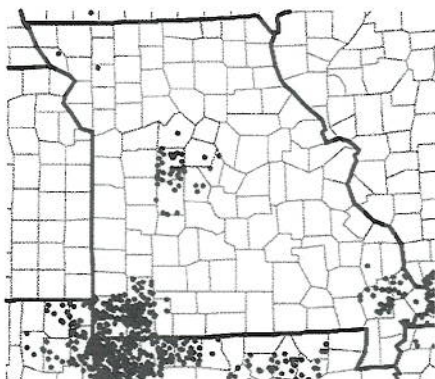


Figure 2 and 3. Number and location of Poultry Farms in Missouri
Broilers *Turkeys*



Energy Savings Opportunities

Among the dairies, some of the most common energy efficiency retrofits will be variable speed drives for the milk pumps and milking vacuum pumps, scroll compressors, plate coolers, compressor heat recovery units, plate coolers, lighting, and ventilation.

Within poultry and swine facilities, the most common energy efficiency retrofits will be side curtain replacements and other insulation upgrades, ventilation, lighting, and adoption of standby generators to reduce electrical load.

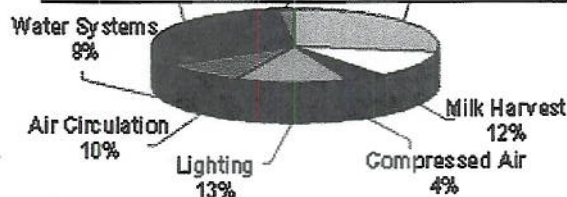
EnSave's experience has shown that energy audits can readily identify the potential for farms to reduce their energy consumption by 25%. Through the grant and revolving loan component of the program, the team will work hard to make sure as many identified retrofits are actually installed.

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Replication by other communities

The intent of the project team is to create an energy efficiency program that can be replicated by other communities. Missouri is like many other states in that it has a significant rural population and a significant number of small animal farms. While the precise mix of farm operations varies by geographic region—virtually all states have some type of agricultural operation and most, if not all, are struggling with the rising cost of energy inputs and the declining costs for their products.

Figure 5. Specific energy uses on dairy farms



The MAESTRO project will demonstrate how a partnership with state agencies, University expertise, the land-grant Extension system and a national private partner can meaningfully impact this niche (agricultural community). MU's presence in the national Extension network and EnSave's national presence in similar agricultural energy programs will ensure the lessons of the project are disseminated to other states. Finally—within Missouri, the MAESTRO program will demonstrate an approach that can be extended to other arms of the agricultural community, such as beef operations and grain drying operations.

Criterion 3: Project Approach Weight:

Management plan

See below in "Roles of Participants" section.

Outreach/marketing strategy

MAESTRO builds upon and strengthens existing partnerships between the cooperating agencies and between those agencies and farmers. It benefits from the fact that the farmers who qualify to participate in the proposed effort already have personal ties to those agencies offering the program through locally delivered technical and financial programs. The lead agencies, together with the Natural Resource Conservation Service (NRCS), have consistently consulted and coordinated their efforts in providing guidance to agricultural producers and processors on issues related to agricultural policy and implementation of best management practices. In addition, funding is often coordinated at the programmatic level. The outreach plan builds upon those relationships and expands them to include newer approaches to sharing information.

The University of Missouri-Columbia (MU) is Missouri's Land Grant University. Through University Extension, MU has staff in every county in Missouri and works closely with farmers providing technical support and training. MU provides not only personal approaches to farmers through its extension activities, but produces publications specifically targeted to sectors of the agricultural community and web sites that will not only market this program, but also ensure awareness of the result achieved. Technical support from the Colleges of Agriculture, Food and Natural Resources, Human Environmental Sciences, and Engineering will supplement outreach by Extension offices. MU and EnSave carry the success of this program beyond Missouri through the Extension Network. Through their participation in national meetings and the consortium of land grant colleges and universities, MU staff can promote similar approaches in other states and provide the technical tools for adoption well beyond the population of farms directly served through this effort.

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The Missouri Department of Agriculture (MDA) has many existing programs that provide technical and financial support for Missouri's farmers. Loan programs that direct funds to animal agriculture make up a significant part of MDA's portfolio of support for farmers. MDA will increase the visibility of the program through its web site, through annual, regional and topical conferences and through one-on-one interactions with farmers. MDA also has strong ties to Missouri's agricultural commodity groups, providing additional, non-governmental groups to inform farmers about this program. MDA also works closely with the Rural Electric Cooperatives and the financial sector to address the needs of farmers providing an existing communication network to support this effort.

Through the Soil and Water Conservation Program, the MDNR works with local Soil and Water Districts in each county to distribute funding from the half of the one-tenth cent Parks and Soils Tax designated to implement technologies and practices that reduce soil erosion and enhance water quality. Many of these practices serve to reduce energy use while protecting Missouri's natural resources. Once more, we have the advantage of existing, local contacts that work closely with farmers.

The Missouri Energy Center is also housed with the DNR and provides funding through both Low Income Weatherization Program and the State Energy Program. The Center intends to leverage the funding and public awareness provided through those programs, where appropriate, to support MAESTRO. In recognition of its critical role in Missouri's economy and the potential for energy savings, The Center has chosen agriculture as one of the focus areas for its State Energy Program funds, creating an additional synergy with this program.

Missouri's Electric Cooperatives support this effort and will use billing notices and Rural Missouri, their magazine, to advertize this program and to ensure that farmers are aware of the opportunity. The Cooperatives currently operate energy auditing programs as a service to their customers. The high visibility of this effort and the broader range of contact with farmers should increase demand for these services, providing another benefit to rural Missouri.

EnSave will augment the program marketing strategy by recruiting farms and agricultural organizations to participate as well. EnSave's primary focus will be the recruitment of equipment manufacturers and equipment dealers to support the program. EnSave has established relationships with these firms through its national work, and knows how to encourage them to support a program. The equipment dealers have a vested interest in promoting the program because the MAESTRO will essentially offer a discount on their products. Similarly, the dealers will advocate for the program because they can sell more products. EnSave has trained staff of program representatives who regularly work with manufacturers and dealers to encourage them to enroll their farm customers in an energy efficiency program. These efforts with the equipment manufacturers and dealers will also create jobs and transform the market by increasing demand for energy efficient farm equipment. Finally, EnSave has several national partnerships that it can activate within Missouri to support the MAESTRO. Partnerships with Dairy Farmers of America, the National Association of Resource Conservation and Development Councils, the Innovation Center for U.S. Dairy, and the National Association of Conservation Districts can encourage support of the MAESTRO by Missouri-based leaders of these organizations.

The leveraging of outreach efforts in many ways mimics the leveraging already occurring with regard to environmental practices on farms. However, by using the skills represented on the MU campus, MAESTRO mixes traditional methods of communication with new media to provide multiple means of advertizing. These groups have worked in the past on common publications and shared messaging. Coordination of the details of this program, eligibility and funding methods will be critical to providing a clear and consistent message to farmers and to assure that confusion does not dissuade any farmer from participating.

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Finally, farmers are our best form of advertizing. Word-of-mouth and the publication of the results will make the benefits of this program clear to all who qualify. We also expect that the successes during the first three years of this program will create a demand for continued efforts by all the partners to promote and extend an energy efficiency message and programs to other parts of the agricultural community in successive years.

Funding structure and implementation/delivery plan

In this project the Missouri Agricultural and Small Business Development Association (MASBDA) will administer the low interest loans and rebates that are made to animal farm operations after they receive an energy audit. The following funding structure and implementation plan was designed to make the retrofitting activities affordable for farmer owners who are extremely cash strapped, while also ensuring adequate revenue flow to the project for long-term sustainability. Details of the structure are below.

Farm Energy Audits: The project will provide rebates for the cost of energy audits for the farm (\$1,500) and the farm residence (\$500). Rebates (100%) will be provided if three of the top five energy saving recommendations is implemented.

Grants and Loans: The project will provide grants and loans that are sized to reduce the payback time. Loans are not to exceed \$10,000 (farms) and \$15,000 (farm residence). Grants are not to exceed \$2,000 (farms) and \$3,000 (farm residence).

Monitoring/verification plan

EnSave, Inc. will use its extensive experience to create an EM&V protocol and quality control plan that will be used to evaluate and verify energy savings within the program. The MU Pollution Prevention Program, which has experience collecting and reporting energy savings data to federal agencies, will be responsible for implementing the EM&V protocol and quality control plan.

The Pollution Prevention team will be responsible for training a dedicated EM&V intern to carry out the bulk of the EM&V activities. In the past several years the Pollution Prevention control team has used Environmental Protection agency funding to finalize a successful intern model for use in EM& V activities. Once the plan is underway, EnSave will ensure the plan is working according to its intended design.

Institutional, regulatory, or market barriers and approaches to overcoming those barriers.

- Hesitancy of farmers to take out more loans given financial position.
- Agriculture is experiencing economic hardships as noted earlier
- Bringing someone to your farm that is not familiar with Missouri farms.

The hesitancy of farmers to participate in the program will be addressed by providing adequate data and other information about the cost savings resulting from energy retrofits and other components of the marketing plan that is provided by all agencies participating in the project. The grant and low interest loans are designed to address the economic hardship currently experienced by small farmers. The team has deep roots in Missouri. Extension associates are known in every county, and many of these individuals even attend church on Sunday with the farmers.

Addressing environmental, health and safety, permitting, and compliance issues

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MDNR houses the state environmental programs and the state Historic Preservation Office. The partners are aware of these issues and will interface with the appropriate agencies to ensure that all environmental, health and safety, permitting, and compliance requirements are followed.

Criterion 4: Partnership Structure and Capabilities Weight: 25%

The project team includes two state agencies responsible for energy issues and agriculture, as well as the flagship campus of the state University system and the land-grant portion of the University system. EnSave, Inc. is the national leader in agricultural energy efficiency. EnSave brings to the project extensive relationships with agricultural energy contractors. MU Extension brings to the project a statewide human resource infrastructure of local specialists that interact with dozens of local community groups each year. The State of Missouri agencies bring to the project relationships with key agricultural stakeholders. Together—the applicant team is extremely diverse in its personnel and available networks.

The partnership structure and roles of each partner have been clearly articulated and are described in the “Project Roles and Responsibilities” section below.

Project Plan and Timetable:

Task	Year 1	Year 2	Year 3
Attend kickoff meeting	X		
Finalize implementation plan for first year and set up coordination with residential program for farmstead evaluations.	X		
Determine product specification sheets for equipment qualifying for grants.	X		
Develop ranking guide for energy audits	X		
Develop and submit program documents for DOE approval	X		
Launch program description and add program links to web site. Set up coordination of file-sharing sites for the team.	X		
EnSave contacts national partnerships to help launch the program and begin enrolling farms, working with MU Extension.	X		
Produce streaming video to promote program	X		
Create EM&V protocol and quality control plan. MU Pollution Prevention Internship Program shall be the third party evaluator.	X		
Implement EM&V program		X	X
Call appropriate equipment manufacturers to introduce the program and get their support.	X		
Send introductory letter and flyer to appropriate equipment manufacturers.	X		
Call appropriate equipment dealers to introduce the program and get their support.	X		
Send introductory letter and flyer to appropriate equipment dealers.	X		
Send introductory letter and flyer to appropriate agricultural community members.	X		

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Continue to reach out to equipment manufacturers.	X	X	X
After initial marketing efforts, continue to create and mail direct mail pieces to manufacturers and dealers.	X		
Design case studies for technology transfer.	X		
Attend farm events (workshops, technology transfer, conferences).	X	X	X
Determine farmer eligibility.	X	X	X
Enter customer data into tracking system database as appropriate.	X	X	X
Conduct ranking guide for farmers interested in audit	X	X	X
Approve farm for energy audit	X	X	X
Conduct farm energy audits	X	X	X
EnSave conducts data collector training	X		
EnSave conducts FEAT training.	X		
Create course module in energy management		X	
Process farmer applications for equipment grants.	X	X	X
Make loans, award grants, and rebates	X	X	X
Send feedback form to farmer following participation, and track farmer feedback in database.	X	X	X
Calculate and report energy savings and emission reductions from installed farmer projects.	X	X	X
Track the budget internally.	X	X	X
Development of monthly reports.	X	X	X
Development of quarterly reports.	X	X	X
Development of annual reports.	X	X	X
Finalize 2nd year implementation plan.		X	
Finalize 3rd year implementation plan.			X

Major Milestones, Tasks and Decision Points	Year 1	Year 2	Year 3
Hold kickoff meeting.	X		
Finalize implementation plan for first year.	X		
Develop ranking guide for energy audits.	X		
Deploy customer relationship management tool to track activities of field staff.	X		
Create EM&V protocol and quality control plan.	X		
Implement EM&V program by MU Pollution Prevention Program.		X	X
Design case studies for technology transfer.	X		
Implement BRIDG program to track customer data.	X	X	X
Conduct farm energy audits.	X	X	X
EnSave conducts training for data collector(s).	X		
EnSave conducts FEAT training for MU Extension.	X		
MU field staff conducts audits using FEAT.		X	X

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MU/EnSave create course modules in energy management.		X	
Submit annual reports.	X	X	X
Finalize 2nd year implementation plan.		X	
Finalize 3rd year implementation plan.			X
Submit final report.			X

	Year 1		Year 2		Year 3	
	Request	Leveraged funds	Request	Leveraged funds	Request	Leveraged funds
Total MDA	\$354,643		\$346,732		\$346,732	
<u>Contractual</u>						
University of Missouri/EnSave sub	\$1,032,864	\$460,595	\$998,404	\$477,661	\$992,138	\$495,309
Professional Development (training, etc.)	\$3,600		\$3,600		\$3,600	
Internet/cell communication	\$3,600		\$3,600		\$3,600	
Systems furniture	\$11,586					
Ag audit grants by EnSave (\$1,500 per grant x 97 grants)	\$145,500					
EnSave FEAT (\$500 per audit x 97 rebates)	\$48,500					
MU FEAT (\$500 per audit x 186 rebates)	\$31,000		\$31,000		\$31,000	
Ag Implementation grants (20%) (\$2,000 per grant x 200 grants)	\$240,000		\$80,000		\$80,000	
Ag Implementation loans (80%) (\$8,000 per loan x 200 loans)	\$960,000		\$320,000		\$320,000	
Farm Home Implementation grants (20%) (\$3,000 per grant x 225 grants)	\$225,000		\$225,000		\$225,000	
Farm Home Implementation loans (80%) (\$12,000 per loan x 225 loans)	\$900,000		\$900,000		\$900,000	
Subtotal costs	\$3,956,293	\$8,450,000	\$2,908,336	\$4,275,000	\$2,902,070	\$4,275,000
<u>Missouri Department of Natural Resources</u>		\$10,400,000		\$10,000,000		\$10,000,000

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Proposed project organization and success

The team has the major governmental and university organizations that support agriculture in the State of Missouri. These include the MDA, the MDNR, MU Extension, and the University of Missouri. EnSave, a national agricultural energy specialty company with over 18 years of successful experience, will enhance the efforts of the aforementioned Missouri based agencies and organizations.

Relevance and Outcomes/Impacts:

Justification for approach—utility of outcomes for target community

The project impact to individual farms discussed below takes into account both decreased use of energy and increased efficiency of production that accompanies the retrofits. For the farmer deciding to make the change, the increased animal production efficiency may be more important than the cost savings. For society, production per unit of energy is the critical metric. As world population and trade increase, increased production efficiency allows food and fiber needs to be met with reduced increases in energy consumption.

- The MU expects that a minimum of 222 new jobs will be created within the target population and at the same time, farmers will be able to remain gainfully employed on their own the farm. At the same time they will be reducing their carbon footprint by using less energy each year.
- These efforts will increase the energy efficiency of farms and farm residencies on the average of \$2,071 per farm each year. Since we expect as many as 290 farms to participate, this will save the small farm community \$606,000 each year. Since this is construction based activity and we expect to see \$25,000 of construction activity for each farm, the total new economic activity for the rural community as a result of the project is expected to be \$7,250,000. Typically construction funds turn seven times, so this should ultimately result in \$50,750,000 of new economic activity as a result of fund expended for the target population.

Long term impact—sustainability beyond the grant funding period

This project will leverage funds at the ratio of 5:1, using a combination of funds from the MDNR' Missouri Energy Center and its Soil and Water Conservation Program; from the MDA's LINK deposits and agricultural loan guarantee programs, and through the in-kind contribution of faculty and staff time to the project from these branches of government and the MU. The specific amounts are detailed above in the Section entitled *Criterion 1—Leveraging and Sustainability*.

Together, these leveraged resources will result in the ability of University Extension specialists and Missouri DNR and Agriculture personnel being able to offer potential animal farmers a suite of loans, rebates and educational resources that will ease their transition to retrofitting activities. In the first three years of the project this will result in a total of \$10M in retrofitting activities.

Beginning with year four after all DOE grants funds have been initially expended the program will be sustained through a revolving loan fund—making it possible for a long-term impact on more animal farm operations, as well as other high energy use agricultural operations such as irrigation farmers or farmers who do extensive crop drying. Loan repayments will be deposited into a revolving fund. Each year, new loans will be distributed based on the previous years ending balance after personal services and expenses

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The Department of Energy's strategy of saturating a focused community is an especially strong concept with the farming community—decades of experience with farmers of all types of all aspects of farming technique have made clear that the best way to motivate farmers to implement new approaches is to have their neighbor demonstrate it first.

As such, the strategy of offering and encouraging the retrofitting to all small animal farmers will be especially effective. The goal of saturating the small animal farm community in Missouri is to permanently transform the market so energy efficient methods and renewable energy sources are the new first choice among farmers—with positive impact on the environment and the farm's financial viability.

Roles of Participants:

Roles of participating organizations

Missouri Department of Agriculture
Grant administration/management.

College of Agriculture, Food and Natural Resources /Human Environmental Resources

The faculty from the colleges of Agriculture and Human and Environmental Resources will hire or reassign the scope of work for their extension field staff to facilitate with the farm and farm residence energy audits. They will be trained, as necessary, by EnSave in the first year of the project so that potential audits are first identified, information is gathered, and audits will be conducted both efficiently and effectively. These extension associates will also assist with the marketing and planning of the project.

University of Missouri—College of Engineering

The College of Engineering will provide technical engineering support for energy efficient retrofit technologies applied on the farm. Engineering faculty will transfer technological data and application information developed during this project to the appropriate engineering courses. The College's Pollution Prevention Internship Program will perform the EM&V activities.

Missouri Department of Natural Resources

The Department of Natural Resources will leverage a portion of its efforts in the Energy Center and Soils and Water Conservation Program to support this proposal. The Department will also coordinate efforts between the Soil and Water Conservation Districts in each county and our partners to support a common message and increased enrollment by farmers in this effort. The same message will be used in implementing the agricultural section of the State Energy Program, where that program overlaps with this proposal. Dr. Joe Engeln will serve as the Department's coordinator in this proposal, maximizing coordination internally and with the partners. He also will serve as the department's representative on the steering committee.

Missouri Agricultural and Small Business Development Authority (MASBDA)

MASBDA will administer the program grant fund. It is housed in the MDA. It will make payments for approved audit rebates and eligible retrofit practices. In addition, MASBDA will make and collect low interest loans from the grant fund and administer the revolving fund. MASBDA staff has daily contact with lenders, commodity groups, adult agriculture educators, equipment suppliers, agribusinesses, and especially farmers. MASBDA will implement an intensive program promotion campaign in an effort to make the target audience and their suppliers aware of the program.

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EnSave

EnSave's tasks will encompass helping launch the program, creating marketing materials and other program documents, assisting with outreach to equipment manufacturers and equipment dealers, helping oversee the implementation of energy-saving projects on farms, and assisting with tracking, planning, and reporting.

Additionally, EnSave will train MU Extension staff in the data collection procedure for farm energy audits, and in the use of its Farm Energy Audit Tool (FEAT). Both trainings will enable Missouri contractors to develop farm energy audits. EnSave will create the evaluation, measurement & verification (EM&V) plan for the program, and will oversee the integrity of the EM&V process by reviewing the process of the third-party evaluator.

Finally, EnSave will help create a college-level course content about agricultural energy efficiency, to be incorporated into MU Extension's training program. Taken together, EnSave's efforts in this project will ensure a quick launch while also setting up an infrastructure to continue the project after the initial term.

Management plan

A kickoff meeting will be held during the first few weeks of the project. All partners will attend the meeting and the foundation will be laid for the team to move forward to facilitate energy retrofits for the target population.

The project manager will plan and conduct, at a minimum, monthly meetings for the agriculture field staff, EnSave, and the human environmental field staff. The project manager will hold at minimum quarterly meetings between select faculty/staff from the MDA, the Missouri Department of Natural Resources, MU Extension, and the colleges of Engineering, Agriculture Food and Natural Resources, and Human and Environmental Sciences.

A Customer Relationship Management (CRM) computer software program such as Active Collab (<http://www.activecollab.com>) will be purchased and training conducted on the use of this software. The tracking features found in CRM software will facilitate the completion of goals that are essential during completion of the project.

EnSave will be responsible to jump start the project, train the auditors, implement a marketing campaign, and also facilitate the use of FEAT as an assessment tool for use by the MU field specialists. MU Extension field staff will begin conducting farm and farm residence audits during the latter part of year 1, after training has been received by the extension associates.

Evaluation will be conducted as outlined in the EM&V plan developed by EnSave. This EM&V plan will be conducted by the MU Pollution Prevention Program intern program.

All team members will be involved in the development of educational modules that will be deployed on a MU web server. Farmers, MU field staff and others will use the internet to review these educational modules.

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Relevant experience of major organizations

The applicant team is composed of all of the significant contributors to agriculture and energy efficiency in Missouri. The team combines the research expertise of MU faculty in energy efficient technology and farm practices, the outreach capability of MU Extension, alongside the leveraging potential of the MDNR and loan administration structure within the MDA.

Missouri Department of Agriculture – Promoting and Protecting Missouri Agriculture

Established in 1933 by the General Assembly, the Department of Agriculture promotes and protects Missouri's multi-billion dollar agriculture and agribusiness industry. The department also enforces state laws that regulate and market the agricultural industry.

The department's divisions include Agriculture Business Development, Animal Health, Grain Inspection and Warehousing, Plant Industries and Weights and Measures. The department also houses the Missouri Agricultural and Small Business Development Authority, the Missouri State Fair, State Milk Board and the Missouri Wine and Grape Board.

University of Missouri Extension—College of Agriculture, Food and Natural Resources

MU personnel hold significant skills and experience in the delivery of energy efficiency programs. MU Extension is established as the premier source of guidance for Missouri farmers. Researchers and Extension Specialists at MU have conducted educational activities that demonstrate the benefits of energy conservation for several years.

Many of the faculty currently on staff at MU began their energy research, extension, and education activities during the early 1980's. As a result, MU has extensive knowledge of the types of equipment used on Missouri farms. MU Extension has worked directly with Missouri farmers since 1914.

In 2009, MU Extension has held over 1,100 informational sessions for the agricultural community; sixteen sessions in nine counties have been directed toward energy conservation, energy efficiency, and alternative energy.

Missouri Department of Natural Resources

The Missouri Department of Natural Resources houses the State Energy Center and the Soil and Water Conservation Program. These two participating programs have been successfully operating in Missouri for more than three decades. The State Energy Center serves as the lead for all energy efficiency efforts in Missouri. It administers federal energy program and energy block grant programs. The Soil and Water Conservation Program is supported by a state sales tax to provide technical and financial support for farmers seeking to reduce soil loss and improve water quality through the adoption of a number of defined practices. The program funds local Soil and Water Districts in each county in Missouri to actually implement those practices most suitable for local soils, weather conditions and agricultural practices. Many of these practices also create energy savings for farmers through modernization of equipment, improvement of practices and reduction in the use of fuel for agricultural vehicles, buildings and practices.

Missouri Agricultural Small Business Development Association

MASBDA staff holds significant skills and experience in administering loans, loan guarantees and grant programs. MASBDA currently administers sixteen loan programs for Missouri farmers, and staff have one-on-one contact with all borrowers in the initial loan process and conducts on farm visit or site visits on an annual basis. In addition, MASBDA staff has an extensive and well established statewide network

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of agriculture professional, media, equipment suppliers, commodity groups, rural electric cooperatives and farmers. That network will be utilized to promote the project as presented in this proposal.

EnSave

EnSave is considered the leading agricultural energy efficiency implementer in the United States. Its clients include state and federal energy and environmental agencies, investor-owned utilities, agricultural trade associations and rural electric cooperatives. Since 1991, EnSave has performed farm energy audits for over 2,000 agricultural producers across the United States.

EnSave was the most-represented firm in the American Council for an Energy Efficient Economy (ACEEE)'s 2005 report on Energy Efficiency Programs in Agriculture, and in its 2007 follow-up report about the agricultural energy efficiency infrastructure. ACEEE also presented EnSave with a Champion of Energy Efficiency award for its leadership and innovation in the design and delivery of energy efficiency programs for America's farms.

Other partners

MU Extension personnel work directly between the farmer and the local equipment dealers, electricians, and mechanics are trusted sources of advice and information. Our team knows the extended agricultural community of USDA Natural Resources Conservation Service, USDA Rural Development, Conservation Districts, Resource Conservation & Development Councils, Farm Bureau, Milk cooperatives, and other such entities that work with farmers. MU will work with these organizations to build support for the program, and to ensure these trade allies are fully engaged in what we are doing. This ensures that by the time a farmer hears about the program from MU, they will have heard about the program from those they know and trust.

Relevant experience of key project directors'/managers

Jane McIntosh (Director)

Jane McIntosh is the grant manager for the Missouri Department of Agriculture. She has sixteen years of service with the department and ten years experience in this position-providing department assistance with all facets related to grants, cooperative agreements, financial assistance agreements, contracts, and subcontracts. She has ten years experience with the annual development of the department's indirect cost proposal and negotiation of the cost rate. In this proposal, she will be responsible for the overall project administration/management including the coordination of ARRA reporting activities in collaboration with the Missouri Office of Administration. She is the key contact and will work alongside the Project Director, Project Manager, Principal Investigator, and DNR key contact, Dr. Joe Engeln.

Leon Schumacher (Project Director)

Leon Schumacher is a full professor and program chair in the Agricultural Systems Management (ASM) Program in the College of Agriculture, Food and Natural Resources. He has managed agricultural energy demonstrations (Tractor Maintenance for Fuel Efficiency, Tractor Ballasting for Fuel Efficiency) for MDNR. He has also managed numerous Biodiesel demonstrations for Missouri special interest groups, (one of which was for MDNR – (fueling with B20)) and has logged operational data for over 1,000,000 miles of biodiesel powered vehicles. Schumacher also manages the efforts of the Agricultural Mechanics Ag Idea program for the MU, Iowa State University, the University of Nebraska, and Kansas State University. The Ag Idea program is a distance educational effort that allows students to enroll in coursework without traveling to the distant campus.

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Robert Reed (Project Manager)

Robert Reed is a research associate professor in the Civil and Environmental Engineering Department at the MU. Reed has more than 40 years experience in government, industry, consulting and academia. He has worked in water treatment and supply, wastewater treatment, treatment plant operations, storm water management, air pollution control and municipal engineering. His involvement in animal agriculture includes various family relationships, providing managerial oversight to the initial development of Missouri's confined animal feed (CAFO) permitting and enforcement, and working as an MU Extension certified CAFO designer and as a National Pork Producers (NPPC) certified environmental and odor control auditor. In this project Reed will serve as Project Manager, coordinating the roles of other key personnel and providing oversight for the roles of partner organizations, providing overall direction for the key activities of the project.

Jo Britt-Rankin

Jo Britt-Rankin is Associate Director of Human Environmental Sciences for MU Extension. Dr. Britt-Rankin has over fifteen years of experience in statewide Extension outreach, including serving as Director of the Food Stamp Nutrition Education program, which provides food safety education to over 250,000 Missouri citizens each year. Dr. Britt-Rankin also directs HES Extension's involvement in Extension-wide housing and energy programs, personal financial management programs and strengthening families programming. Currently Dr. Britt-Rankin manages approximately \$11 million in grant funds annually and is co-Director of MU Extension's Healthy Lifestyles Initiative. Dr. Britt-Rankin earned her PhD in Nutrition, Foods and Food Systems from MU.

Joe Engeln

Joe Engeln serves as the Assistant Director for Science and Technology at the MDNR. From this position in the Director's Office, he will serve as the Department's coordinator for this activity ensuring that the Director and the program involved in this effort are fully informed and integrated into this effort. Dr. Engeln has worked closely with the Department of Agriculture and the University during the decade he has held his current position. He coordinated the three partners' response to federal rules for farmers as Missouri was the only state that submitted comments jointly from its agriculture and water quality agencies in coordination with its Land Grant University.

Amelia Gulkis

Amelia Gulkis is the Program Development Manager for EnSave. She is a member of the management team for EnSave, responsible for setting overall company goals and policies. She has overall responsibility for the Program Management staff. She has nearly a decade of experience in proposal development, planning, and project management. The last six years have been spent exclusively in the field of agricultural energy efficiency. Amelia will serve as the primary contact person between EnSave and the project team, and will oversee achievement of EnSave's deliverables within the project.

Rex Ricketts

Rex Ricketts is Director of MU Extension Commercial Agriculture Program. Ricketts works with interdisciplinary teams to provide relevant programs that are futuristic for Missouri's agriculture producers. Teams include Beef, Dairy, Swine and Crops. These teams deliver programs to the target audiences identified in this grant. Ricketts works closely with beef, swine, crops and dairy commodity organizations working with their executive directors in policy, production and management areas. He brings industry experience having worked for Ralston Purina and Cargill Nutrena Mills. In this project, Ricketts would hire Extension Associates identified in this budget and coordinate and integrate their efforts.

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Tony Stafford, Principal Investigator

Tony Stafford is the director of The Missouri Agricultural and Small Business Development Authority. The Small Business Development Authority promotes the development of agriculture and small business and to strive to reduce, control and prevent environmental damage in Missouri. The authority provides additional sources of financing at interest rates that are below conventional rates.

American Recovery and Reinvestment Act Information

The project will promote and enhance the objectives of the American Recovery Act. There will be an increase in the amount of energy efficient equipment and materials being sold, installed, and maintained. Each of these areas of effort requires an adequate workforce. This increase will consequently require that additional jobs be created.

Reducing the cost of production agriculture and agricultural home energy will keep farm families in the industry in their homes and on their farms.

This project will contribute to economic recovery as it will reduce farm operating costs. This will be accomplished by increasing local sales of equipment and materials, which will in turn increase the demand for the manufacture of energy efficient equipment and materials.

The number of jobs created by these efforts is estimated to be 222 as a result of the project. MU feels strongly that this job creation will not end at the close of the project, as efforts will be in place to make this a sustainable activity for years to come.

This is a link to the ACEEE jobs calculator which we used for our assumptions. Note that the calculator opens up with sample inputs in it and -- not our numbers.

<http://www.aceee.org/energy/national/ACEEE%20Energy%20Stimulus%20Jobs%20Impact%20Calculator%20July%202009.xls>

Missouri Agricultural Energy Saving Team – A Revolutionary Opportunity (MAESTRO)

The Missouri Department of Agriculture submits this proposal in partnership with the University of Missouri, The Missouri Department of Natural Resources and EnSave Energy Performance, Inc. This program will be directed by **Jane McIntosh** at the Missouri Department of Agriculture, principal investigator is **Tony Stafford** at the Missouri Department of Agriculture, Missouri Agriculture and Small Business Development Authority with the University portion of the effort coordinated by **Robert Reed and Dr. Leon Schumacher**.

This project will focus on the small-sized animal agriculture segment within Missouri's significant agricultural economy, a major energy consumer in the state. Missouri is second only to Texas in the number of farms. Prices of agricultural commodities in this segment have not kept pace with input costs, including energy leaving small farmers struggling to keep their homes and their land. Past funding history has identified this segment as one that uses a significant amount of energy and a proven interest in programs that support more effective farm operation. We propose an initiative to implement energy saving technologies in farm homes, buildings and practices, and to make the lessons learned available to all small farmers through an educational, interactive web site. The complementary focus on buildings in this effort and on agricultural practices in existing state programs creates the ability to focus on all aspects of farm life, enhancing the value of participation in the program for farmers.

The Missouri Department of Agriculture has joined with other state agencies, our land grant university, utilities, financial partners and private businesses to create a program that will saturate the small scale, animal agriculture market segment of Missouri's agricultural community with programs that will increase energy efficiency and improve overall environmental performance. The deliverables from this project will include a coordinated education campaign, energy audits created especially for the small farmer, increased training and business opportunities for those interested in the field of agricultural energy efficiency, technical assistance in sustainability and a legacy web site and skill set that will promote the expansion of this effort well beyond the grant period and the initial farm population to be served.

We have identified, using conservative methods, over \$47 million that the state will invest in agricultural practices for these farmers over the next three years and offer that sum, plus other identified resources, as leverage for this effort at a level of **\$49.6** million over three years. By pairing state funding focused on agricultural practices and federal funding focused on building retrofits, Missouri will promote holistic reviews of energy use and savings on a farm-wide basis.

Biographical Sketch
TONY STAFFORD
Missouri Agricultural and Small Business Development Authority

A. Education and Training

Missouri State University	Agriculture Business	B.S., 1974
University of Missouri	Public Administration	M.P.A., 1996

B. Professional Experience

- 1997-Present Executive Director, Missouri Agricultural and Small Business Development Authority
Responsible for the planning, development, directing, coordinating, implementing, promoting, evaluating and administering of financial programs which assist in the creation or expansion of agricultural and small businesses. Staff supervision and financial oversight and coordination of grants, value-added loan guarantees, tax credit programs, beginning farmer loan program, animal waste treatment loan program, and single-purpose loan guarantees. Presentation of applicant information and recommendations to the board. Provide program information to individuals, lenders, businesses, and legislators as well as state and federal agencies. Development and review of the strategic plan. Serve as Secretary/Treasurer of MASBDA.
- 1992 – 1997 Program Administrator, Agriculture Development Fund
Supervised seven employees in the preparation and monitoring of the program budget (\$5,000,000), investments, fiscal notes, reports and correspondence, coordination with federal, state and local agencies. Planned, directed and evaluated activities designed to create public awareness of financial assistance programs as well as developed, implemented and evaluated program policies, procedures and activities.
- 1987 – 1992 Loan Representative Coordinator, Agriculture Development Fund
Trained, coordinated and supervised the activities of the ADF Loan Representatives in the promotion and education of the Agriculture Development Fund programs through visits and meetings with lending institutions, vocational agriculture instructors, extension youth specialists, college financial aid personnel, high school counselors, and the media. Duties also included the initial inspections and loan closings of the Missouri Alternative Loan Program.
- 1983 – 1987 Loss Control Inspector/Underwriter, IGF Insurance Company
Responsible for field underwriting operations for Western Missouri. Performed rating inspections and loss control surveys of property, liability, workers' compensation, automobile insurance policies and surety bonds of commercial agri-business policy holders to identify and evaluate loss exposure, analysis of risk control, selection of the most effective risk management alternatives and ways to implement and monitor selected risk controls. Duties also included settling claims and completing insurable value property appraisals.

- 1981 – 1983 Grain Warehouse Auditor II, Missouri Department of Agriculture
Responsible for performing field audits of grain warehouses and grain dealers in Missouri. Audits included auditing the grain records and financial records to ensure grain warehouse and grain dealer laws were complied with, audits also included a physical grain inventory to ensure quantity and quality standards were maintained.
- 1975 – 1981 Exchange Manager, MFA, Inc
Supervised 12 employees in the management of a retail agri-business operation. Duties included preparing an annual budget and monthly budget analysis to ensure budget compliance. Duties also included the daily management operations of the business administration of accounts payable, accounts receivable, payroll, financing, inventory controls, credit, personnel procedures, buying, capital improvements, and staying in compliance with all applicable laws.

C. Synergistic Activities

- The Missouri Agricultural and Small Business Development Authority administers grants, loans, loan guarantees, and tax credit programs to aid Missouri farmers. The annual program budget exceeds \$35,000,000 with assets totaling over \$10,000,000. Housed within the Missouri Department of Agriculture, the authority is governed by a seven-member bipartisan commission. Tony manages a staff of six.
- Since 1997 Tony has been instrumental in the passage and implementation of four tax credit programs with an annual capacity of \$9.3 million. Under Tony's direction two loan guarantee programs have been doubled to better serve Missouri's agriculture. The two guarantee programs have the capacity to guarantee over \$36,000,000 in loans. In cooperation with the State Treasurer, Tony has been successful in expanding the Linked Deposit Program to include eligible processing facilities.
- Tony also serves as board member and treasurer of the National Council of State Agricultural Finance Programs. The council represents the state and national interests of state agricultural finance programs in the development of legislation, regulation and consideration of other issues that affect the ability of such programs to meet their intended purpose.
- Tony also served as board member and president of the National Association of Rural Rehabilitation Corporations. The association is a 26 member state organization which assists with the administration and management of some \$150,000,000 in assets. The member states are dedicated to fostering the long-term economic development and stability of family farms and rural communities.
- Tony is a United States Air Force veteran and served over 20 years in the Missouri Army National Guard in various capacities.

Biographical Sketch
JOSEPH F. ENGELN
Missouri Department of Natural Resources

A. Education and Training

Ohio University	Geology,	B.S., 1980
Member, Phi Beta Kappa; Distinguished Graduate in Geology		
Northwestern University	Geological Sciences	M. S., 1982
Thesis: Subduction Seismicity of the Lesser Antilles Arc		
Northwestern University	Geological Sciences	Ph. D., 1985
Dissertation: Seismological Studies of Divergent Boundaries		

B. Professional Experience

1999-present	Assistant Director for Science and Technology, Missouri Department of Natural Resources
1999-2003	Adjunct Associate Professor of Geological Sciences, University of Missouri
1991-1999	Associate Professor of Geological Sciences, University of Missouri
1990-1992	Acting Program Scientist and Acting Program Manager, Geodynamics Program, National Aeronautic and Space Administration, NASA Headquarters
1985-1991	Assistant Professor of Geological Sciences, University of Missouri
1985-1990	Geotechnical Consultant, Terraform Engineers, Inc.

C. Publications

- Author or co-author of over 20 publications on topics including earthquake seismology, tectonics, Karst hydrology, geodesy, mountain building and marine geophysics.
- Author or co-author of over 50 abstracts presented at professional meetings.
- Research support from NASA, NSF, NATO, National Geographic Society, Eisenhower Foundation, Missouri CBHE, American Chemical Society and corporate sources between 1985 and 1999.

D. Synergistic Activities

- Current role: Advise the Director and other department personnel on science and technology issues and their impact on policy; Develop scientifically-based policy; Prepare reports and correspondence on issues as requested; Represent the Department Director on numerous work groups and panels.
- Skills: Strong scientific background and ability to apply science over a broad range of departmental issues; Critical thinking skills and the ability to explain technical concepts to a non-technical audience; Ability to learn quickly and provide rapid assessment of a given situation or technology; Ability to understand the very detailed aspects of an issue (including scientific, technical, policy and economic aspects); Ability to work with diverse stakeholders to develop and implement policy; Ability to create ideas or concepts and lead those concepts from conception to implementation; Recognition of non-scientific aspects and challenges that influence policy.

- Scientific issues include: Premium Standard Farms Consent Judgment (state technical representative on Management Advisory Team); Confined animal feeding operations (CAFO's) water quality, air quality and advanced technologies; Missouri River operations and resulting hydrological, habitat and species impacts; Wetland mitigation and restoration methodologies; Wild and Natural Areas policy and implementation; Ecosystem restoration; New Madrid Seismic Zone; Environmental Impact Statement (EIS) reviews; Nutrient management and water quality; Gulf of Mexico hypoxia; Distribution and effects of MTBE; Scientific evaluation of Total Maximum Daily Load (TMDL) models; Odor regulatory science; Feral hogs; Use of remote sensing for environmental assessment; Drought/Flood data assessment; business assessments for permitting and other environmental and energy requirements; Enterprise data standards and integration; Information technology prioritization and operations; Led team that won national ECOS Award for Innovation in a State Regulatory Program for a program that allowed on-line determination of all environmental permitting requirements.
- Facilitation: Facilitate discussions of numerous internal and external stakeholder groups; Coordinated review of NASA Research Announcement "Dynamics of the Solid Earth;" Facilitated Basin Monitoring section of the Science Strategy of Mississippi River/Gulf of Mexico Nutrient Task Force; Director of three summer workshops for K-12 teachers; workshop named one of the "100 Most Innovative Approaches to Science and Math Education" by the Annenberg Foundation and Corporation for Public Broadcasting. Serves with members from DNR, the University of Missouri, the Missouri Department of Agriculture and the Natural Resources Conservation Service on the Interagency Technical Work Group, which coordinates technical aspects of implementing federal and state programs for farmers.

Biographical Sketch
LEON G. SCHUMACHER
University of Missouri

A. Education and Training

North Dakota State University, Fargo ND	Ag Education/Composite Science Ag	BS, 1977
North Dakota State University, Fargo ND	Ag Education/Vocational Education	MS, 1984
Iowa State University, Ames IA	Education/Ag Mechanics	PhD, 1987

B. Professional Experience

2005-Present	Professor and chair of Agricultural Systems Management, University of Missouri, Columbia, MO
1990-2005	Associate Professor of Biological Engineering/Agricultural Systems Management, University of Missouri, Columbia, MO.
1989-1990	Assistant Professor of Agricultural Education, North Dakota State University, Fargo, ND.
1987-1989	Assistant Professor of Agricultural Engineering/Agricultural Education, University of Missouri-Columbia, Columbia, MO.
1984-1986	Adjunct Instructor in Agricultural Engineering, Iowa State University, Ames, IA.

C. Publications

i) Five Related Publications

1. Schumacher, L.G., Van Gerpen J., & Adams, B. (2004) Biodiesel Fuels. Encyclopedia of Energy. Elsevier Science. 525 B. Street, Suite 1900, San Diego, CA. (final submission for printing Sept. 30, 2003).
2. Schumacher, L.G. (2004) Biodiesel Lubricity. Chapter in the Biodiesel Handbook. AOCS Press. Champaign, IL.
3. Schumacher, L. G. and B. T. Adams. (2008) Lubricity Effects of Biodiesel when Used with Ultra Low Sulfur Diesel Fuel. Accepted for Publication-*Applied Engineering in Agriculture*. ASABE 24(4), 0883-8542.
4. Humburg, D. S., T. J. Hansen, L. G. Schumacher, A. K. Mahapatra, G. L. Taylor, and B. T. Adams. (2006). Biodiesel use and experience among state DOT agencies. *Applied Engineering in Agriculture* 22(2): 177-184.
5. Schumacher, L. G., Peterson, C. & Van Gerpen, J. (2005). Engine Oil Analysis of Biodiesel Fueled Engines. *Transactions of ASAE*. 21(2), 153-158. (35%) .

ii) Other Significant Publications

1. Schumacher, L. G., Soyly, S., Van Gerpen, J., & Wetherell, W. (2005). Fueling Direct Injected Engines with 2% Biodiesel Blend. *Transactions of ASAE*. 21(2), 149-152 (30%)
2. Chiu, C; Schumacher, L.G.; Suppes, G. J. (2004) Impact of Cold Flow Improvers on Soybean Biodiesel Blend. *The Journal of American Oil Chemists Society*. Champaign, Illinois 27 (2004): 485-491.
3. Schumacher, L. G., Ess, D., Strickland, R., & King, B. (2002). Agricultural Systems Management in The New Millennium. *Journal of Agricultural Systems, Technology, and Management*, 15. (35%)
4. Schumacher, L. G., Clark, N., Lyons, D., & Marshall, W. (2001). Engine Exhaust Emissions

Evaluation of Biodiesel Blends Using a Cummins L10E Engine. *Transactions of ASAE*, 44(6), 1461-1464. (30%)

5. Schumacher, L. G., Marshal, W., Krah, J., Wetherell, W., & Grabowski, M. (2001). Biodiesel Emissions Data from Series 60 DDC Engines. *Transactions of ASAE*, 44(6), 1465-1468. (30%)

D. Synergistic Activities

- Kelly, Debi and L.G Schumacher. Biofuels 101. Organized and conducted a two day biofuels workshop for Missouri agricultural extension personnel. November 24-25, 2009.
- Schumacher, LG. (2005) Considerations for Biodiesel Implementation. Biodiesel Utilization Workshop, Boise, Idaho. 9/2005
- Graduate students were lead authors on two articles published in *Journal of Agricultural Education, American Association of Agricultural Educators*.
- Authored two articles regarding teaching and training

Biographical Sketch
JO BRITT-RANKIN
University of Missouri

A. Education and Training

University of Illinois-Urbana/Champaign,	Human Development & Family Ecology	BS, 1989
University of Missouri	Human Nutrition,	
	Foods & Food Systems Management	MS, 1992
University of Missouri	Human Nutrition	
	Foods & Food Systems Management	PhD, 2000

B. Professional Experience

September 2008	Associate Dean—Extension, College of Human Environmental Sciences, University of Missouri
	Interim Associate Dean—Research & Graduate Studies, College of Human Environmental Sciences, University of Missouri
	Extension Associate Professor
Adm	Administrative Director, Family Nutrition Education Programs (FNEP)
January 2006	Associate Dean—Extension, College of Human Environmental Sciences, University of Missouri--Columbia
	Extension Associate Professor
Adm	Administrative Director, Family Nutrition Education Programs (FNEP)
March 2004-2006	Associate Dean—Extension, College of Human Environmental Sciences, University of Missouri--Columbia
Adm	Administrative Director, Family Nutrition Education Programs (FNEP)
May 2003-2004	Interim Director, Center for Adolescent Sexuality, Pregnancy and Parenting
	Interim Associate Dean, Human Environmental Sciences Extension
	State Nutrition Specialist
Adm	Administrative Director, Family Nutrition Education Program (FNEP) University of Missouri—Columbia Extension
January 2003-2003	Interim Associate Dean, Human Environmental Sciences Extension
	State Nutrition Specialist
Adm	Administrative Director, Family Nutrition Education Program (FNEP) University of Missouri—Columbia Extension
January 2001-2002	State Nutrition Specialist
	Unit Leader, Nutritional Sciences Extension
Adm	Administrative Director, Family Nutrition Education Program (FNEP) University of Missouri—Columbia Extension
July 1998 –2000	Associate State Nutrition Specialist
Adm	Administrative Director, Family Nutrition Education Program (FNEP)

University of Missouri—Columbia Extension

1995-1998 Regional Nutrition Specialist
University of Missouri Outreach & Extension

1993-1995 Graduate Instructor
University of Missouri—Columbia

1990-1993 Teaching Assistant
University of Missouri—Columbia

C. Synergistic Activities

- Principal Investigator for University of Missouri Residential Energy Program proposal submission to Missouri Department of Natural Resources—November 2009.
- Served as Associate Dean/Program Director, HES Extension, since 2003. Have oversight for all MU Extension Housing and Residential Energy Programs.
- Served as Interim Associate Dean, HES Research & Graduate Studies, 2008-2009. Worked closely with the Department of Architectural Studies and the international Solar Decathlon. This competition was a joint entry with Missouri S & T. Also supported the 2011 application for joint participation again in the international Solar Decathlon.

Biographical Sketch
SANJEEV K. KHANNA
University of Missouri

A. Education and Training

Indian Institute of Technology, Kanpur	Mechanical Engineering	B.S., 1982
Indian Institute of Technology, Kanpur	Mechanical Engineering	M.S., 1984
University of Rhode Island	Mechanical Engr & Applied Mechanics	Ph.D., 1992

B. Professional Experience

2006-present	Assistant Director, Missouri Industrial Assessment Center, University of Missouri (MU), Columbia, MO
2001-present	Associate Professor, Mechanical & Aerospace Engineering Dept., MU
1997-2000	Assistant Professor, Mechanical Engineering Dept, South Dakota School of Mines & Technology, Rapid City, SD
1994-1997	Lecturer, Mechanical Engineering Dept, University of Missouri-Rolla, Rolla, MO
1992-1994	Research Engineer, Mechanical Engineering Dept, Texas A&M University, College Station, TX
1988-1992	Research Assistant, University of Rhode Island, RI, USA
1984-1988	Design Engineer, Hydro turbines, Bharat Heavy Electricals Ltd, Bhopal, India

C. Publications

i) Five Related Publications

1. D. Bergin, J. Lynch, S. K. Khanna, and S. S. Nair, "Infusing Design into the G7-12 Curriculum: Two Example Cases", *International J. of Engineering Education*, V23(1), pp 43-49, 2007.
2. C. H. Jenkins and S. K. Khanna, "Mechanics of Materials: A Modern Integration of Mechanics and Materials in Structural Design" *Elsevier Science*, ISBN 0-12-383852-5, Feb. 2005.
3. S. K. Khanna, "A New Course on 'Welding Engineering and Design of Welded Structures' to Better Train Engineering Graduates for The Future", *Proceedings (on CD-Rom) of American Society of Engineering Education, Montreal, Canada, June 2002*.
4. S. K. Khanna, Jenkins, C.H., and Royslance, D. "A New Approach to Integrated Instruction of Mechanics and Materials Science," *Institution of Mechanical Engrs.: J of Materials, Application and Design*, Vol. 216, Part L, pp 49-53, 2002.
5. S. K. Khanna and B. Wu, A Multipronged Approach to Educating Energy Conscious Engineers, ASME 2008 International Congress, Nov. 1-6, 2008, Boston, MA

ii) Other Significant Publications

1. X. Long, S. K. Khanna, L. Allard, "Effect of Fatigue Loading and Residual Stress on Microscopic Deformation Mechanisms in a Spot Welded Joint" *Materials Sc. & Engineering A*, V454-455, pp 398-406, 2007.
2. B. Sonny Bal, M. N. Rahaman, Q. Fu, S. K. Khanna, M. D. Ellingsen and P. Tirunagari, "Nanoceramics and Ceramic Nanocomposites in Prosthetic Hip and Knee Joints", *Handbook of Nanoceramics and Their Based Nanodevices*, Ed. H. S. Nalwa, American Scientific Publishers, in print, 2008.

3. X. Long and S. K. Khanna, "Modeling of an Electrically Enhanced Friction Stir Welding Process Using the Finite Element Method", *J. of Science and Technology of Welding and Joining*, V10(4), pp 482-487, July 2005.
4. S. K. Khanna, R. Winter, P. Ranganathan, K. Paruchuri, S. Yedla, "Investigation of Nanomechanical Properties of the Interphase in a Fiber Reinforced Plastic Composite", *ASME Transactions: J. of Engineering Materials and Technology*, V125, No.2, pp 90-96, 2003.
5. S.K. Khanna, R. Winter, P. Ranganathan, S. Yedla, M. Kalukanimuttam, K. Paruchuri, "Surface Preparation Techniques for Nanomechanical Characterization of Fiber Reinforced Polymer Composites", *Composite Part A: Applied Science and Manufacturing*, Vol. 34, #1, pp 53-65, Jan. 2003.

D. Synergistic Activities

- Sanjeev K. Khanna is currently La Pierre Associate Professor and the Assistant Director of Missouri Industrial Assessment Center (MoIAC) funded by the DOE. He has a major role in providing technical assistance to Missouri industries to improve the energy efficiency of their industrial systems, and promote energy efficiency among engineering students and industries in the state. He has five years of experience in energy efficiency and related areas, industrial energy audits, implementation of energy saving measures, industrial audit data recording and report writing, and has received training in DOE/EERE Compressed Air Best Practices. He has been involved in conducting joint industrial energy audits with Missouri Department of Natural Resources (DNR) and Missouri Enterprise. He has also conducted energy efficiency workshops across the state of Missouri in collaboration with the energy center of DNR and other staff of MoIAC.
- He is active in the American Society of Mechanical Engineers (ASME) as Chair of the ASME Applied Mechanics Education Technical Committee and has regularly conducted technical sessions on educating engineers for the energy industry.
- Dr. Khanna has conducted extensive research on developing and characterizing new structural materials. These research projects have been funded by both federal agencies (such as DOE, NSF, Homeland Security) and industrial organizations (Ford Motor, Auto-Steel Partnership) and has been the principal investigator on over \$2,000,000 of funded grants.
- Khanna has been teaching for the last fifteen years and has also developed new teaching strategies and such pedagogical research has been funded by the National Science Foundation (NSF). He has taught extensively in the areas of manufacturing, design of industrial systems, welding engineering, and mechanics of materials and published a text book on integrated teaching in these areas. He is currently the PI on his fourth NSF-CCLI grant on introducing problem based learning in undergraduate materials science courses.

Biographical Sketch
ROBERT E. REED
University of Missouri

A. Education and Training

University of Missouri	Civil Engineering	BS,	1968
University of Missouri	Sanitary Engineering		MS, 1969
University of Missouri	Public Administration		
	w/ Public Finance Specialty		MPA, 1984
University of Missouri-Rolla	Environmental Engineering		PhD, 2002

B. Professional Experience

2008 - Present	Co-Director, Center for Sustainable Energy, University of Missouri, Columbia, MO.
April 2006 - Present	Research Associate Professor, Water Resources Research Center, College of Engineering, University of Missouri, Columbia, MO.
1993 – 2006	Branch Office Manager & Environmental Engineer, MECO Engineering Company, Inc.
1989-1993	Principal Engineer/ General Manager, Howard Moore Group, Springfield, MO.
1979-1989	Deputy Program Director, Division of Environmental Quality, Missouri Department of Natural Resources (MDNR), Jefferson City, MO
1974-1979	Supervisor of Application Engineering, Clow Corporation Waste Treatment Equipment Manufacturing Division, Florence, KY
1973-1974	Construction supervisor, Henry Lurie & Associates (consulting engineering), Cincinnati, OH
1969-1973	Assistant Chief, Base Engineering Planning, U.S. Air Force, 90th Civil Engineering Squadron, Warren AFB, WY

C. Synergistic Activities

- The MU Center for Sustainable Energy coordinates energy related programs for the University. These programs are grouped in categories of Education, Research, Service, Policy and Economics, and Commercialization. Dr. Reed coordinates the areas of Education including academic and current workforce training, and Service including energy efficiency internships and major industrial energy efficiency projects (large scale waste heat recovery and reuse, large scale geothermal heating and cooling). He participates in facilitating team-building and proposal development for Research, and Policy and Economics, and assists in analyzing Commercialization opportunities.
- Reed supports and promotes the energy related work of other MU Programs including 1) the Provost's Community College Relations Office, and 2) the national and international award-winning Facilities Management Energy Management Department that includes a biomass co-fired CHP power plant, a smart grid distribution system, and a facility energy management remote sensing and control system; these combined provide an annual energy cost avoidance of \$6,500,000.
- He is currently managing the development of Energy Efficiency in Water and Wastewater Treatment program. This is an interdisciplinary and inter-organizational activity.

- Reed's involvement in animal agriculture includes various family relationships, providing managerial oversight to the initial development of Missouri's confined animal feeding (CAFO) permitting and enforcement, and working as an MU Extension certified CAFO designer and as a National Pork Producers (NPPC) certified environmental and odor control auditor.
- Dr. Reed is the engineering instructor for the Pollution Prevention (P2) Internship course. The P2 Program is a university internship based on the USEPA P2 Program. The course is a three credit hour engineering course that covers waste reduction and industrial energy efficiency technologies.

Biographical Sketch
REX RICKETTS
University of Missouri

A. Education and Training

University of Missouri	Agriculture	B.S.,	1963
University of Missouri	Dairy Husbandry		M.S., 1964
Thesis area: Milking Management			
University of Missouri	Dairy Husbandry		Ph.D., 1970
Thesis area: Calcium and Phosphorus Ratios—Collateral field: Extension Education			

B. Professional Experience

1989	Director, University Missouri Extension Commercial Agriculture Program
1985	Chairman, Department of Dairy Science
1982	Appointed Interim Chairman, Department of Dairy Science
1980	Promoted to Professor, Dairy Science
1978	Appointed Project Leader, Dairy Extension Program
1976	Promoted to Associate Professor, tenured in Department of Dairy Science
1970	State Dairy Specialist, University of Missouri-Columbia, Assistant Professor
1969-70	Ralston Purina, farm and ranch management development specialist
1963-66	Cargill Nutrina Mills—sales and sales management

C. Publications

- Authored, Co-authored, written and presented more than 200 time
- 8 Refereed Journal (Author and Co-Author)
- 6 Abstracts in professional Journals (Author and Co-Author)
- 1 Book (Co-Author)
- 10 University of Missouri Guide Sheets (Author and Co-Author)
- 158 Newsletter and magazine articles (Author and Co-Author)
- 10 National and State invited program presentations
- Calcium and Phosphorus research cited in the 1978, 1988, 1989 National Research Council for Dairy Cattle Nutrition

D. Synergistic Activities

- Missouri Agricultural Extension Professional State Agriculture Leadership Award 2006
- Gamma Sigma Delta, Honor Society of Agriculture
- Gamma Sigma Delta Distinguished Award for Administration 2005
- Friends of World Dairy Expo Award 2002
- Epsilon Sigma Phi Visionary Leadership Award 2001
- Epsilon Sigma Phi State Distinguished Service Award 1996
- Dairy Leadership Award, Missouri Dairy Hall of Honors Foundation, 1993

- Missouri Pork Producers President's Service Award, February 1993
- Epsilon Sigma Phi - Extension Honorary, President-elect 1989-90; President 1990-91
American Dairy Science Association

Biographical Sketch
MAX E. SUMMERS
University of Missouri

A. Education and Training

University of Missouri	Agribusiness	BS, 1966
University of Colorado-Boulder	Bank Management & Marketing	1971-1974
Missouri Western State College, St. Joseph	Coursework in consumer behavior & marketing research	1988-1989

Major Certificate Programs

1971	University of Oklahoma-Norman, Commercial Lending School, 40Hrs
1975	University of Iowa, Commercial Insurance Certificate, 40Hrs
1980-1981	University of Colorado-Boulder, School of Bank Marketing, 160Hrs
1985	University of Colorado-Boulder, School of Bank Marketing Colloquium, 80 Hrs
1994	National Development Council, Economic Development Finance, 160Hrs

Certifications

1994	Certified Economic Development Finance Professional
1987	Series 7 and 63 Securities License
1970	Licensed insurance agent in the State of Missouri

B. Professional Experience

1989-Present	State Director, Missouri Small Business Development & Procurement Centers, University of Missouri, Columbia, MO 65211
1988-1989	Regional Director, NWMSU Small Business Development Center Maryville, MO 64468
1986-1987	Acting Director, Midwest Rural Health Associates, Inc. 301 East Armour Blvd., Suite 420, Kansas City, MO 64111
1970-1988	Partner, McCrory, Summers and Associates, Inc. 610 State St., Mound City, MO 64470
1967-1986	President and CEO, Missouri Farmers Bank Maitland & Mound City, MO 64466
1976-1986	President and CEO, Missouri Bancshares, Inc. Maitland, MO 64466

C. Synergistic Activities

1996	President, Association of Small Business Development Centers
1992-1997 & 2000	Board or Directors of Association of SBDCs
1998-Present	Senior Examiner & Judge, Missouri Quality Award Program
1998-Present	National Chair (2000-04) & member of the ASBDC Accreditation Committee
2006-Present	National Chair (2007) and Member of ASBDC Legislative Committee

Biographical Sketch
AMELIA GULKIS
EnSave

A. Education and Training

University of Sussex, Brighton, UK	1999–2000	
University of Vermont	History B.A.,	2001
Lake Champlain Regional Chamber of Commerce, Leadership Champlain Program,	2005–2006	
Champlain College	Management Excellence Seminar Series	2009

B. Professional Experience

2004-Present	Program Development Manager, EnSave
	<ul style="list-style-type: none">• Work with owners to create procedures for program implementation, company best practices, and strategic planning for company• Research potential clients with the goal of creating a program to match current funding• Create proposals and implementation plans for farm energy efficiency programs• Oversee proposal development process• Transition new programs from the development stage to operations stage• Supervise Marketing Coordinator and three Program Managers
2003-2004	Development Associate, Fletcher Allen Health Care
2001-2003	Development Researcher, Fletcher Allen Health Care
2000-2001	Special Collections Assistant, University of Vermont

C. Synergistic Activities

- California Dairy Energy Efficiency Program: Develop program implementation plan, training plan for program managers and support staff, and create initial marketing materials, supervise program manager
- Ag Efficiency Plus, 2006-2008. Work with prime contractor to develop proposal and implementation plan, in first several months of program develop training plan for program manager and support staff, create initial marketing pieces and oversee launch of program
- Maryland Statewide Farm Energy Audit Program (2006-current): Develop program design and implementation plan, develop marketing pieces, manage program from 2007-2009; supervise program manager from April 2009- present, provide quarterly reports of progress
- Texas Agricultural Technical Assistance Program (2008-2009): develop program proposal and implementation plan, attend kick-off events and planning sessions with client, develop initial program procedures and documents, supervise program manager.
- Minnesota Farm Energy Conservation Improvement Program (2005-2006): design, implement and administer program for Minnesota Power and Alliant Energy – Interstate Power and Light Co. This was a Midwest energy efficiency program.

Missouri Agricultural Energy Saving Team – A Revolutionary Opportunity

University of Missouri Grant Budget Justification

Key Personnel

Leon Schumacher (Principal Investigator, 10% FTE leveraged funds). Leon Schumacher is a Professor of Agricultural Systems Management at the University of Missouri (MU). His research focuses on energy conservation and the use of alternative fuels for diesel engines. Schumacher has done extensive work with Missouri farmers, showing them how standard maintenance procedures to the engine and proper ballasting of farm tractors can increase their efficiency, saving them both time and money (and energy). In this proposal Schumacher will be responsible for overall project management and work alongside the co-PI and Project Manager to ensure timely progress of the project. Schumacher will also be the main point of contact for partners (Missouri Department of Natural Resources, Missouri Department of Agriculture and EnSave).

Robert Reed (co-Principal Investigator, 5% FTE). Dr. Reed is a research associate professor in the Civil and Environmental Engineering Department at MU. Reed has more than 40 years experience in industry, academia and business—including providing managerial oversight to the initial development of Missouri's confined animal feed (CAFO) permitting and enforcement, and working as an MU Extension certified CAFO designer and as a National Pork Producers (NPPC) certified environmental and odor control auditor. In this project Dr. Reed will serve as co-Principal Investigator, providing overall direction to the Project Manager for the key activities, ensuring timely progress toward milestones and appropriate spending and assisting the PI with compiling reports required by the Department of Energy.

Jo Britt-Rankin (5% FTE). Dr. Britt-Rankin is Associate Director of Human Environmental Sciences for MU Extension. Dr. Britt-Rankin has over fifteen years of experience in statewide Extension outreach, including directing Extension-wide housing and energy programs and personal financial management programs. In this proposal Britt-Rankin will supervise the efforts of the six Housing Specialists who will perform residential audits on farm homes.

Sanjeev Khanna (8% FTE) Dr. Khanna is an associate professor in the Mechanical and Aerospace Engineering Department at the University of Missouri. Khanna's research is in the area of solid mechanics and materials, nano-mechanical behavior of materials and welding engineering. Khanna has been integrally involved in the Missouri Industrial Assessment Center and has worked with students to conduct energy audits and recommend energy conservation steps for industrial firms. In this project Dr. Khanna will help convert the project experience into modular coursework for students and other extension activities.

Agricultural Extension faculty (2.5 @ 100% FTE leveraged funds).

**Note: All salary figures are inflated by 3% in subsequent years.*

Missouri Agricultural Energy Saving Team – A Revolutionary Opportunity

University of Missouri Grant Budget Justification

Other personnel

Program Manager (100% FTE). Because the MAESTRO project involves partners in state agencies, Extension personnel throughout the state, producers and contractors and suppliers throughout the state and contractual relationships with outside vendors—there will be extensive project communication and coordination. The project will therefore hire a full time Program Manager to serve as a first point of contact for the project. This position will work under the supervision of the co-PI (Bob Reed) and will be responsible for a variety of professional and technical level support activities.

Extension Associates (4 @ 100% FTE). Four full time Extension Associates will be hired by the project to interact directly with farmers and perform audits in years 2 and 3. The Extension Associates will also be trained by the Missouri Department of Agriculture on the financials of the loan packages so they can assist farmers with packaging loans. As a primary “face” for the project in the field to consumers (farmer producers), these four positions will spend a significant amount of time traveling and networking with potential participants, contractors and suppliers.

Housing Specialists (6 @ 10% FTE). The project will use the professional services of six Human Environmental Sciences Housing Specialists from MU. The Housing Specialists are located throughout the state and trained to assist with decisions regarding home energy use and weatherization. The MAESTRO project will train the Housing Specialists to perform residential energy audits and consultations for farm residences. Each Housing Specialists will commit 10% FTE to the project.

Agricultural Specialists (18 @ 15% FTE leveraged funds). Field staff from the College of Agriculture, Food and Natural Resources are already in place state-wide and are a trusted and well known partner to farmers throughout Missouri. The MAESTRO project will use the time of select Agriculture field staff to understand the local agricultural community and to recruit farmer participation.

Pollution Prevention Coordinator (8% FTE). The pollution prevention coordinator from MU’s Environmental Assistance Center will supervise the EMV intern. The pollution prevention coordinator has implemented a similar training program for student interns in the industrial sector and will provide guidance on structuring training and field placement for the EMV intern.

BRIDG Database Coordinator (25% FTE) and Administrative Assistant (50% FTE). The Business Research and Information Database Group will commit the time of two staff persons to update the database capability so MAESTRO project staff can collect store and run reports with sufficient data to meet the required ARRA reporting guidelines.

Graphic design and video production. Agricultural Extension has in-house professional staff who will assist the MAESTRO project with graphic design and video production aspects of the project. The project estimates \$12,000 in graphic design costs for flyers and brochures and \$3,500 for video production costs.

Missouri Agricultural Energy Saving Team – A Revolutionary Opportunity

University of Missouri Grant Budget Justification

**Note: All salary figures are inflated by 3% in subsequent years.*

Student personnel

Agriculture Graduate Research Assistant (50% FTE). A half-time Master's Level GRA is requested to support the efforts of the PI.

EMV Intern. An intern will be hired to learn the verification process and perform some of the data collection tasks.

**Note: All salary figures are inflated by 3% in subsequent years.*

Fringe benefits

Fringe Benefits are calculated as direct costs in accordance with MU's indirect cost rate agreement (Department of Health and Human Services: June 12, 2009. Rates in year one are 29.05% for all faculty and staff employed at MU full time (covers health insurance, disability, and paid time off) and 7.65% for staff employed at MU half time (covers FICA insurance). Graduate students benefits in year one are a flat rate of \$2,073 for medical and tuition \$5,538 (18 semester hours @ \$308/hour). Fringe benefits on leveraged salary funds are also counted as leveraged funds.

**Note: All benefit amounts are inflated by 3% in subsequent years.*

Travel

To make possible a statewide program, funds are requested for various project staff to travel to the field to collect data, visit with prospective farmers, check on project progress, attend meetings, as well as other project-related functions. Travel funds are budgeted to include the cost of mileage (\$.52/mile), per diem (\$42/day) and overnight expenses (average of \$125/night).

	Amount	Number	Year 1 Request	Year 2 Request	Year 3 Request
Extension Associate & Program Manager travel expense	\$5,000	5	\$ 75,000	\$ 75,000	\$ 75,000
PI local travel expenses	\$1,000	1	\$ 1,000	\$ 1,000	\$1,000
Co-PI travel expenses	\$2,000	1	\$ 2,000	\$2,000	\$2,000
EMV Intern travel expenses	\$2,500	1	\$ 2,500	\$2,500	\$ 2,500
Housing specialists' travel expenses (HES Extension)	\$ 150	70	\$ 10,500	\$10,500	\$10,500

Missouri Agricultural Energy Saving Team – A Revolutionary Opportunity

University of Missouri Grant Budget Justification

Supplies

The MAESTRO project will require the hiring of several new full time and intern positions. In this category we request funds to outfit the new staff and their offices with appropriate equipment and supplies. We also request general office supplies to make possible a project of this size (paper, toner, cartridges, flip charts for meetings, folders, etc.) and database and standard office software for the Extension Associates and Program Manager.

Contractual

Funds are requested in this category to cover the costs of web site design and maintenance (outside firm, TBD), as well as a substantial subcontract with the agricultural energy conservation firm, EnSave. EnSave's costs are detailed on their separate budget justification.

	Amount	Number	Year 1 Request	Year 2 Request	Year 3 Request
Computer, printer, PDA & other office equipment	\$ 3,500	5	\$ 17,500		
Other office supplies	\$ 1,000	5	\$ 5,000	\$ 5,000	\$ 5,000
EMV office equipment			\$ 2,500	\$ 500	\$ 500
Database software for Extension Associates & Program Mgr.	\$ 150	5	\$ 750		
MS Office software for Extension Associates & Program Mgr.	\$ 300	5	\$ 1,500	\$ 1,500	\$ 1,500
Housing specialists' office supplies (HES Extension)	\$ 100	6	\$600	\$ 600	\$ 600
Computer, printer, PDA & other office equipment	\$ 3,500	5	\$ 17,500		
Other office supplies	\$ 1,000	5	\$ 5,000	\$ 5,000	\$ 5,000
EMV field equipment			\$ 2,500	\$ 500	\$ 500
Database software for Extension Associates & Program Mgr.	\$ 150	5	\$750		
MS Office software for Extension Associates & Program Mgr.	\$ 300	5	\$1,500	\$ 1,500	\$ 1,500

Other

In this category the project requests funds for several activities. A significant portion of the funds here will be to support the ongoing marketing and dissemination activities of the project. Working with EnSave, MU will be constantly engaged in an intensive marketing and awareness activities for the project because communicating with farmers and recruiting participants will be a key challenge of the project.

Missouri Agricultural Energy Saving Team – A Revolutionary Opportunity

**University of Missouri
Grant Budget Justification**

In this category we also request funds for extensive internet and cell communication that will be required to keep all project staff statewide connected, and for office space for new personnel that are hired for the project.

	Amount	Number	Year 1 Request	Year 2 Request	Year 3 Request
Internet/cell communication	\$1,800	5	\$9,000	\$9,000	\$9,000
Office space	\$1,200	5	\$6,000	\$6,000	\$6,000
EMV training course			\$5,000	\$2,000	\$2,000
Database modification by BRIDG (Business Extension)			\$33,625	\$9,625	\$9,625
Printing costs			\$3,000	\$3,000	\$3,000
Marketing costs					
Bulk mailing			\$6,200	\$6,200	\$6,200
Fairs & Events	\$2,000	2	\$4,000	\$4,000	\$4,000
Seminars	\$2,000	8	\$4,000	\$6,000	\$6,000
Tech Transfer events/Presentations	\$3,000	4	\$3,000	\$6,000	\$3,000
Other Presentations	\$300	4	\$1,200	\$1,200	\$1,200

Indirect costs

Indirect costs are calculated in accordance with the allowed rate of 10% of total direct costs as indicated in the Energy Efficiency and Conservation Block Grants Program.